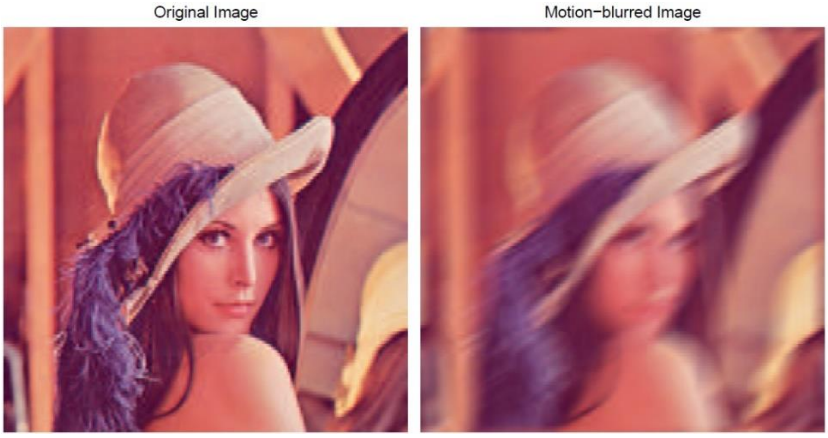
Use the image provided with this computer assignment. Its resolution is 512 by 512.
Bonus: You may double your score from this computer assignment if you do it using Python.

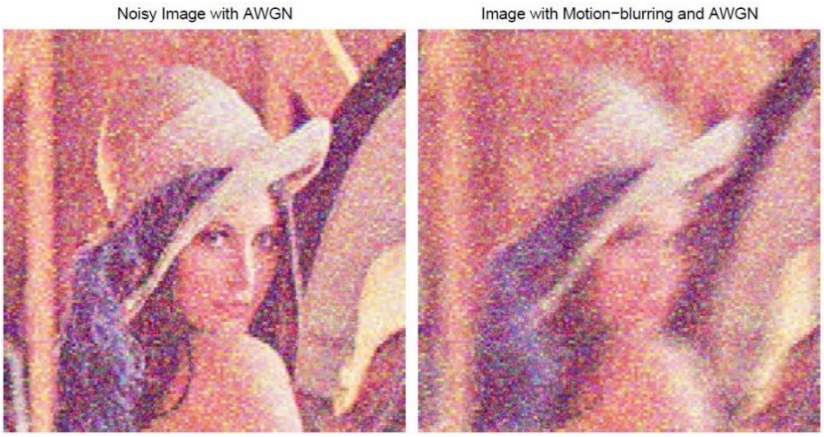
(a) Simulate a case of a linear motion across 20 pixels at an angle of 30 degrees. Use the "`fspecial`" function in Matlab to generate the point spread function (i.e., h(x,y)) of the motion blur filter. Apply the filter to the image and plot the blurred image. The original and blurred images are shown below:



(a) (b)

Fig. 1 (a) the original image (b) motion blurred image

(b) Simulate the effect of the additive noise. Use "`randn`" function in Matlab to generate a noise with the normal distribution with zero mean and variance of 0.25. Add the simulated noise to the blurred image from (a). Plot the image with the additive noise. Fig. 2a shows the noisy original and Fig. 2b the blurred image.



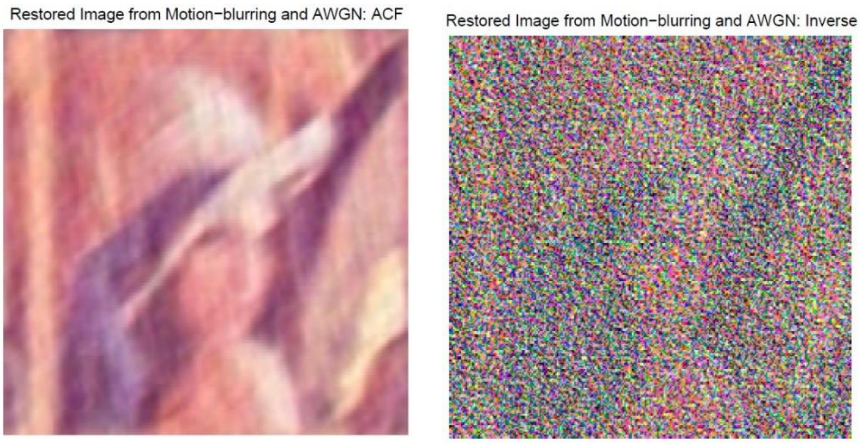
(a) (b)

Fig. 2 (a) noisy original image (b) noisy blurred image

(c) Use the inverse filtering method to restorate Fig. 1(b) (noiseless blurred image). Your result will look like the following figure:

Fig. 3 Result of applying inverse filtering to the blurred image in Fig 1.b

(d) Compute the autocorrelation functions of the image and the noise. Apply the Weiner Filter (using "`deconvwnr`" from Matlab) to the blurred image in Fig. 2b to get a restored image. Plot the restored image. Fig. 4a shows the result of Wiener filtering and Fig. 4b shows the result of inverse filtering both applied to Fig. 2b.



(a) (b)

Fig. 4 (a) noisy original image (b) noisy blurred image

(e) Estimate the quality of the restored image in Fig 4a by computing the SNR (in dB) between the restored image and the original image before blurring and adding noise.

(f) Apply the least square error (LSE) method to Fig. 2b and plot the result. You may use "`deconreg`" function from Matlab.

(g) Estimate the quality of the restored image in part (f) by computing the SNR (in dB) between the restored image and the original image before blurring and adding noise.

موفق باشید